MODEL SCV32A-1

MP MASTER
MA22646

A·P·T ELECTRONIC INDUSTRIES LIMITED
CHERTSEY ROAD
BYFLEET • SURREY
PHONE: BYFLEET 41131/2/3/4/5
GRAMS: APTRAN, BYFLEET

Designers and Manufacturers of Specialised Electronic Apparatus

HANDBOOK FOR

POWER SUPPLY UNIT MODEL SCV32A-1.

Model SCV32A-1 is a Size 32 Power Unit rated for an output of 10.0 Amps maximum at any voltage in the range 0-7 volts and is to be preset to the correct working voltage before use. The unit is fitted with re-entrant power-limiting overload protection.

CONTENTS

Section 1	Data and notes for Model SCV32A-1.
Section 2	Operating notes.
Section 3	Changing the voltage range: setting-up notes.
Section 4	Technical notes, general.
Section 5	Circuit diagrams & component tables.

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A.P.T. Electronic Industries Ltd., Chertsey Road, Byfleet, Surrey.

ENGLAND.

Telegrams:- APTRAN BYFLEET. Telephone:- BYFLEET 41131.

MODEL SCV32A-1.

Section 1 - PERFORMANCE DATA & NOTES.

Mains input voltage:	200-250 volts, 47-450 Hz.
Output voltage:	0-7 volts in four pre-set ranges.
Output current:	10 Amps nominal full load.
Stabilisation ratio:	10,000 minimum.
Output resistance:	Not greater than 0.001 ohm.
Ripple & noise output:	250 microvolts peak-peak, maximum.
H.F. output impedance:	Less than 0.1 ohm from zero to 200 KHz and less than 0.5 ohm up to 1 MHz.
Overload current limit:	Set to between 11A and 11.5A.
Short-circuit current:	Between 1A and 1.5A.
Overload circuit type:	Re-entrant power limiting.
Temperature coefficient:	Temperature coefficient of voltage, over the range 25°C ± 35°C, is not greater than 0.005%/°C.
Ambient temperature range:	-10/+60°C for continuous operation at full load.

The Company reserves the right to alter specifications or improve designs without notice.

Drawings

Main Circuit Diagram:	C 24635.
Component List:	CL 24635 (1 sheet).
Transformer-Rectifier Circuit:	B 25571.
Component List:	CL 25571 (1 sheet).
Control Card Circuit:	B 25570.
Component List:	CL 25570 (3 sheets).
Heatsink Assembly Circuit:	B 25572.
Component List:	CL 25572 (1 sheet).

The Company reserves the right to use alternative components of equivalent specification and performance.

MODEL SCV32A-1

SETTING-UP DATA (see Section 3)

Range No.	Voltage Range	Resistor Values RA	RB	RC	RD	RE	Transformer secondary Erms	Linking
1	0-2	1.2K	o/c	s/c	s/c	s/c	6.47	15-12/TAP to 14
2	1-3	1.2K	o/c	180	s/c	s/c	7.06	15-13/TAP to 14
3	3-5	3.9K	o/c	180	s/c	400	8.82	15-13/TAP to 12
4	5-7	5.6K	o/c	180	s/c	800	10.00	15-14/TAP to 12

Overvoltage Limit

In the remote event of an internal fault in the power supply unit, it is possible for the output voltage to rise substantially above the normal stabilised level.

The following table shows the highest fault voltage under worst conditions, including +10% mains input and very light load. For vulnerable loads of an expensive nature, overvoltage protection units can be supplied.

Range	Overvolt
0-2	9.0
1-3	9.8
3-5	12.5
5-7	14.2

Guarantee

All products of A.P.T. Electronic Industries Limited are guaranteed to be free of mechanical or electrical defects when despatched. Provided that it has been installed correctly and operated within its normal rating, any article will be repaired or replaced free of charge if, within a period of 12 months from delivery to the original purchaser, it is proved, upon examination by the Company's engineers, to be defective in material or workmanship.

The responsibility of A.P.T. Electronic Industries Limited under this guarantee is limited to repairing or replacing any defective article, if returned Carriage Paid to the Company's works at Chertsey Road, Byfleet, Surrey, England.

Section 2 - OPERATING NOTES. (all units)

Mains Voltage Setting.
Installation.
Connections.
Adjustments.

2.1. MAINS VOLTAGE SETTING

These units normally leave the works set for the UK. Standard 240 volt supplies.

The mains transformer panel carries terminals on either side of the fuseholder for adjustment to any voltage from 200-250 volts in 10 volt steps.

2.2. INSTALLATION

The unit should be mounted with the heat-sink fins vertical, with adequate clearance for air-circulation, especially under and over the heat-sink assembly.

Units may be mounted directly side-by-side without restriction, but preferably not above one another, due to the extra temperature rise in the upper unit(s).

2.3. CONNECTIONS

2.3.1. These should preferably be made with the fanning strip supplied, ensuring that the AC. mains wiring is kept away from the DC output wiring.

2.3.2. The main output leads should always be of the heaviest practical rating, in order to minimise voltage drop.

2.3.3. On delivery the Remote Sensing and output terminals are linked on the fanning strip supplied, - the unit should not be operated with these links disconnected, as this will break the stabiliser loop.

2.3.4. When Remote Sensing is required these links must be removed, and light gauge sensing leads added, linking these same terminals at the remote end of the main output leads. These sensing leads must be routed close together, or twisted, to minimise pickup from stray fields.

2.3.5. The main output leads should also be routed close together or twisted, to minimise inductance which will degrade transient response.

2.3.6. Where very long runs are necessary the output leads should be of heavier than normal rating, to minimise the voltage drop. When this exceeds 0.1 volt and remote sensing is used, it may be necessary to adjust the overload current preset control RV3, whose current setting is decreased with increase of output lead volt drop under these conditions.

2.4. ADJUSTMENTS

2.4.1. For normal operation all adjustments are factory preset, - the output voltage control being mounted on the panel, adjacent to the terminal block, for easy access.

2.4.2. The other adjustments, for overload protection calibration, and voltage range calibration, are mounted on the main control card, behind the detachable cover plate.

2.4.3. These should not normally require adjustment, - do not re-adjust any of them without reference to the correct setting-up procedure, in Section 3.

Section 3 - CHANGING VOLTAGE/SETTING-UP. (all units)

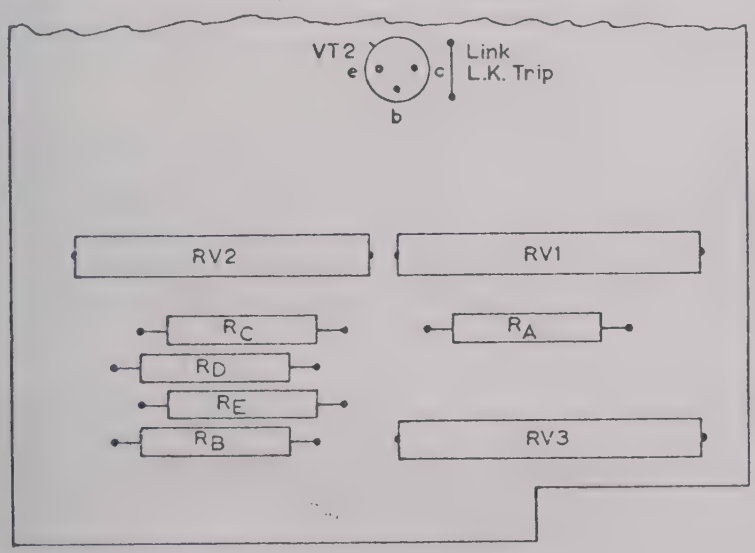
IMPORTANT: Never attempt to change any adjustment unless using accurately calibrated meters.

3.1. CHANGING VOLTAGE RANGE (except Programmable units).

3.1.1. This involves changing the transformer secondary voltage, and one or more resistor values. The necessary data appears in the table at the end of Section 1.

3.1.2. The transformer secondary tappings are brought out on numbered terminals on either side of the transformer.

3.1.3. The location of the resistors on the control card is shown in the diagram below.



A30175

3.1.4. After carrying out the listed changes, switch on the unit (off-load) and check that it covers the new voltage range correctly.

3.1.5. Check the calibration of the overload limit current setting (as specified in Section 1). If incorrect, readjust RV1 and RV3 as detailed in Section 3.2.

3.2. SETTING-UP PRESET CONTROLS (all units)

3.2.1. RV1. Short Circuit Current Control.

This control adjusts the continuous short-circuit current. Commence adjustment with slider at the left-hand end and move it slowly to the right to increase the current to the value specified in Section 1.

NOTE: On low-voltage high current models (with Re-entrant protection only) a correction to the indicated short-circuit current is required, due to the resistance of the ammeter used. This is calculated from the formula:-

$$I_{s/c}\ (\text{indicated}) = \frac{1}{1 - XR} \times I_{s/c}\ (\text{true})$$

where R is the resistance of the ammeter (on the range in use), and X is the slope of the power unit limiter characteristic:

$$X = \frac{\text{Amperes (rated output of the unit)}}{\text{Volts (set output voltage of the unit)}}$$

It is important to ensure that the correct rated value (from Section 1) is inserted as $I_{s/c}$ (true) in the formula above, to obtain the actual reading to be indicated on the meter, - $I_{s/c}$ (indicated).

3.2.2. RV2. Voltage Standardising Control.

This control adjusts the current to 5.00mA in the voltage control potentiometer chain, and should not normally require readjustment in service.

It may be adjusted (on Programmable Units) in order to ensure correct voltage tracking with an external control (200 ohms per volt).

3.2.3. RV3. Overload Limit Current Control.

This control (on models with Re-entrant overload protection only) adjusts the maximum current the unit will deliver under overload conditions. Commence adjustment with slider at the right-hand end and move it slowly to the left to increase the current to the value specified in Section 1.

3.2.4. Sequence of Adjustments.

It is important to adjust RV1 correctly before RV3, to avoid interaction.

3.2.5. Models with Trip Protection.

These models have a soldered link on their control cards, which, when temporarily disconnected, neutralizes the trip function, and enables RV1 (and RV3 when fitted) to be correctly set up. WARNING: Some models with constant-current limiting and trip protection may over-dissipate if kept in the overload region for longer than 1 minute approximately. This point must be kept in mind when testing or setting-up.

3.2.6. Locking of Preset Controls.

These controls are locked with cellulose adhesive (Durofix, Uhu, etc.) after setting-up at the works. They are readily freed with a small knife blade, and should be re-sealed after adjustment, ensuring that no adhesive reaches the track or slider contact.

Section 4 - TECHNICAL NOTES.

4.1. 'Re-entrant' Overload Protection.

4.1.1. This form of protection characteristic causes the power unit to go into a power-limiting condition when an overload is applied, and to recover automatically when the overload is removed.

4.1.2. In this range of power supplies the overload current limit is 112.5% (± 2.5%) of the rated full-load current of the unit (preset by RV3).

4.1.3. As the resistance of the overload is reduced the output voltage (and current) falls linearly until, with a short-circuited output, the residual current is 12.5% (± 2.5%) of the rated full-load current of the unit (preset by RV1).

4.1.4. Figure 2 illustrates the Re-entrant overload characteristic, all load circuits must have a load line (or curve) within the outline of the trapezium ABCD.

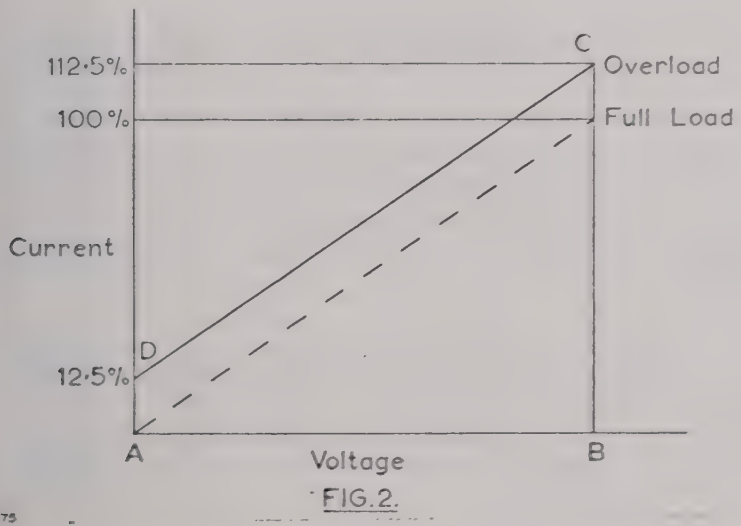


FIG.2.

4.1.5. Because the correct slope for the limiter characteristic depends on the output voltage to which the unit is set, it is generally necessary to reset the limiter slope (RV3) if the output voltage is changed. The short-circuit current (set by RV1) tends to be more constant and rarely requires adjustment.

4.2. 'Constant-Current' Overload Protection.

4.2.1. This form of protection characteristic causes the power unit to go into a current-limiting condition when an overload is applied, and to recover automatically when the overload is removed.

4.2.2. In this range of power supplies the overload current level is 112.5% (± 2.5%) of the rated full-load current of the unit (preset by RV1).

4.2.3. With constant-current protection the power unit has to dissipate the excess power under overload conditions which would otherwise be delivered to the load, and for this reason has to be derated, by comparison with re-entrant protected units. This derating factor is less on low-voltage units.

4.2.4. This form of protection is necessary for loads such as lamps or electronic tube filaments, etc., whose voltage/current characteristic is non-linear, and may exceed the operating boundaries of the re-entrant protection characteristic.

4.3. 'Trip' Overload Protection.

4.3.1. This feature is an optional addition to either 'Re-entrant' or 'Constant-current' protection, when the unit is required to remain cut off after a fault occurrence.

4.3.2. On the incidence of an overload the unit initially limits for a short period, then trips out, reducing the output voltage to zero.

4.3.3. The unit will remain tripped until reset by breaking the mains supply for a few seconds, and then reconnecting.

4.3.4. Some types of load may hold the unit in an overload state on switch-on long enough for the trip circuit to operate. This is particularly the case with large capacitative loads. This range of units has been designed to switch on correctly into 1000μF. per ampere of rated current output.

4.4. OPERATION AS A FLOATING SUPPLY.

These power units are normally to be operated with positive or negative output terminal connected to earth, but they may also be operated 'floating', providing that neither terminal exceeds 500 volts D.C. with respect to earth. With some arrangements it may be necessary to connect a suitable capacitor, from earth to one of the output terminals to minimise the ripple.

4.5. SERIES CONNECTION OF POWER UNITS.

4.5.1. Similar units may be connected in series to provide higher voltages, subject to a maximum terminal voltage of 500 volts D.C. with respect to earth.

4.5.2. Each unit has a reverse current diode across its output terminals to protect the unit from reverse voltage under fault conditions.

4.5.3. It is important to note that under fault conditions a higher rated unit might damage the output diode of a smaller unit connected in series. In such an arrangement a higher current diode should be connected (externally) across the smaller unit.

4.6. PARALLEL CONNECTION OF POWER UNITS.

4.6.1. It is not usual to connect stabilised power units in parallel unless they are specially adapted for this arrangement.

4.6.2. Units in this range except those with 'Trip' protection, may however, if set up to the same voltage, be connected in parallel to deliver a greater output.

4.6.3. In this arrangement, with light load, one unit only will deliver the total output current. With maximum load this unit will operate in its current-limited regime and the second unit will provide the extra current and voltage stabilisation, though in some cases, with a slight increase in ripple output.

4.7. 'PROGRAMMABLE' MODELS.

4.7.1. Standard Programmable models are designed for continuous voltage variation from 1 volt minimum up to the full rated output voltage.

4.7.2. Voltage control is effected by an external variable resistor, or switched network, connected between terminals 4 and 5 of the unit. The circuit is standardised for a control current of 5.00mA., so that the control factor is 200 ohms/volt (see Section 3, para 3.2.2.). The voltage control on the front of the unit is used to set the minimum output voltage of the unit, with no resistance between terminals 4 and 5.

4.7.3. Switched control networks must be designed with all contacts 'make before break', as momentary open-circuits would cause transient up-surges in output voltage.

4.7.4. It is important to ensure that the wiring to, and the components in the external control are well located and shielded from pick-up of hum or interference.

4.7.5. Due to the characteristics of the series stabiliser technique, the speed of response to an 'Up-programming' command is fast, but for 'Down-programming' the response is comparatively slow, as the output capacitor is discharged to a lower voltage through the internal potentiometer network only (at no-load), or a higher rate, when loaded externally.

Section 5 - CIRCUIT AND COMPONENT DATA.

5.1. The complete circuit of the power unit is shown in the diagram immediately following this section. It is a 'Series Regulator' type of stabiliser using NPN silicon power transistors.

5.2. The power unit is built from a number of sub-assemblies, with a minimum of general wiring. This is done for uniformity of performance, and production economy.

5.3. Each sub-assembly has its own circuit diagram and component list, following the main circuit diagram. Components on sub-assemblies are only coded on their sub-assembly circuit diagram, and must be identified by their sub-assembly circuit diagram number, and component reference, e.g. 'B25407, R15'.

5.4. Component Lists show the component circuit reference, title, rating or value, etc., A.P.T. Part Number, and a 'commercial equivalent' where appropriate.

5.5. It is recommended that spares be ordered from A.P.T. (Service Department), quoting the model and serial number of the unit, and the component identification as in paragraph 5.3. above.

5.6. Commercial equivalents, where listed, are generally similar components likely to be satisfactory as replacements, though they may or may not conform to the standards and tolerances required by the A.P.T. Specifications.

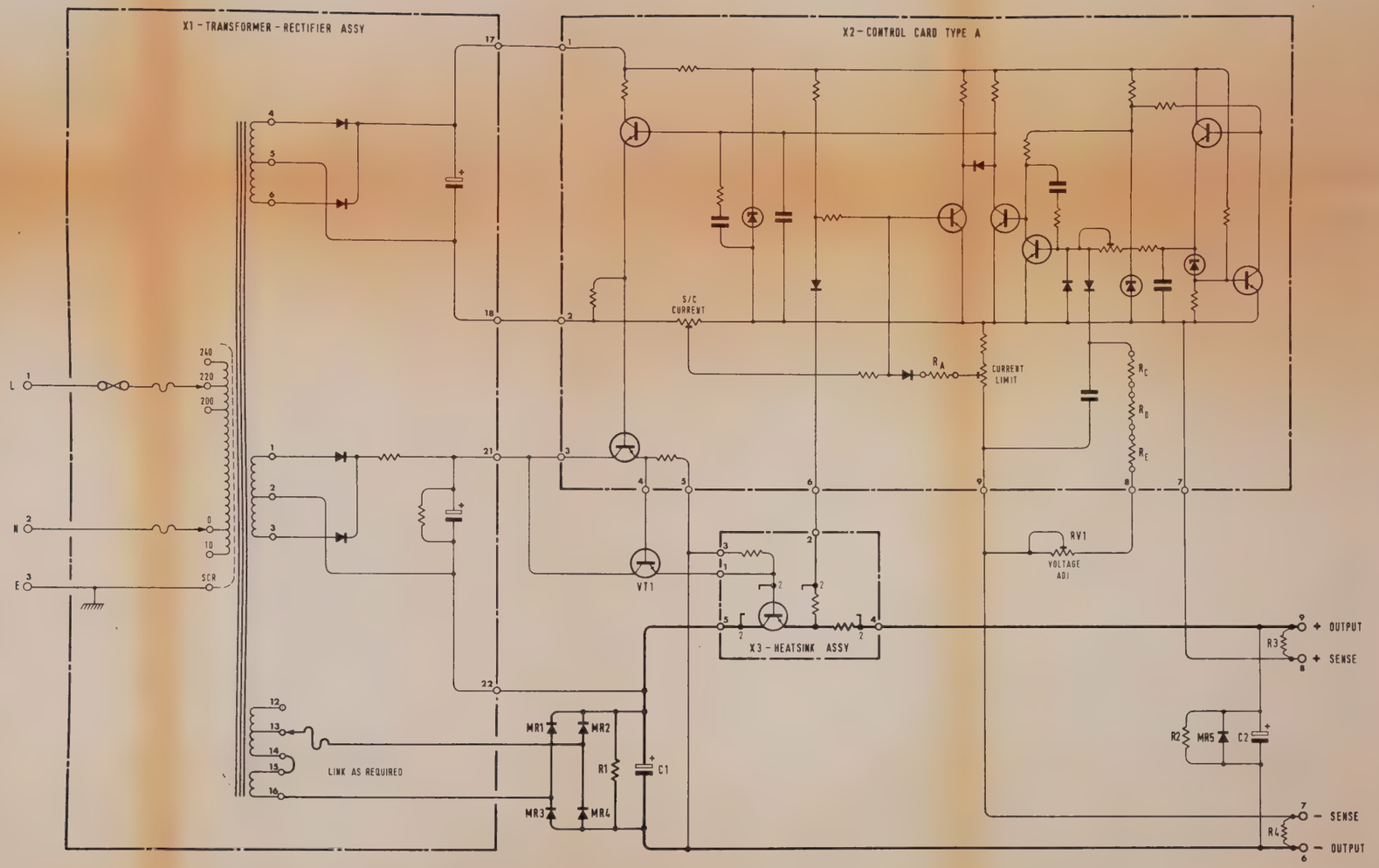
CIRCUIT REF	NAME / REF No.	VALUE	TOL %	RATING
X1	TRANSFORMER-RECTIFIER ASSY. Circuit Diagram No. B.25571			
X2	CONTROL CARD TYPE A. " " B.25570			
X3	HEATSINK ASSY. " " B.25572			
R1	RESISTOR, METAL OXIDE, APT. Pt. No. 23125-331	330	5	½W
R2	" " " " " " 23125-331	330	5	½W
R3	" " " " " " 23125-101	100	5	½W
R4	" " " " " " 23125-101	100	5	½W
RV1	RESISTOR, VAR. W/W APT. Pt. No. 27001-501	500	10	2W
C1	CAPACITOR, ELECT. APT. Pt. No. 11012-209 (4 off)	80,000µF	+50 -20	15V
C2	" " " " " 11009-109	10,000µF	+50 -20	15V
MR1	RECTIFIER, SILICON, MOTOROLA MR1121			
MR2	" " " MR1121			
MR3	" " " MR1121			
MR4	" " " MR1121			
MR5	" " " MR1121			
VT1	TRANSISTOR, RCA 2N3054			

MI No.3421	2	31.5.67
ORIGINAL ISSUE	1	18/4/67
MODIFICATION	ISSUE	DATE

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TITLE	SHEET No 1	CIRCUIT COMPONENT LIST
CIRCUIT DIAGRAM POWER SUPPLY UNIT MODEL - SCV32A-1	of 1 sheets	CL 24635





C24635 Issue 2

MODEL SCV 32A-1

M.I 0421	2	25-6-67
	1	18-4-67
	ISSUE	DATE

CCT. DIAGRAM
P.S.U. MODEL SCV31A-1

C24635

MASTER CIRCUIT C24636

CIRCUIT REF	NAME / REF No.	VALUE	TOL %	RATING
T1	TRANSFORMER APT. Pt. No. TX3006			
F1	FUSE CARTRIDGE, APT. Pt. No. 62310 - 302			3A
R1	Omitted			
R2	RESISTOR, W/W, APT. TYPE SF	1.2	5	2W
R3	" , METAL OZIDE, APT. Pt. No. 23125-331	330	5	½W
R4	Omitted			
R5	Omitted			
C1	CAPACITOR, ELECT. APT. Pt. No. 11001-507	500 UF	+50 -20	30V
C2	" " " " " 11002-108 (3off)	3000 UF	+50 -20	15V
C3	Omitted			
MR1	RECTIFIER, APT. Pt. No. 71211 - 01 (BYX36-100)			
MR2	" " " " 71211 - 01 (BYX36-100)			
MR3	" " " " 71211 - 01 (BYX36-100)			
MR4	" " " " 71211 - 01 (BYX36-100)			
MR5	Omitted			
MR6	Omitted			
MR7	Omitted			
MR8	Omitted			

MODIFICATION	ISSUE	DATE
	3	14/9/67
Mi No. 3477	2	7.7.67
ORIGINAL ISSUE	1	18/4/67

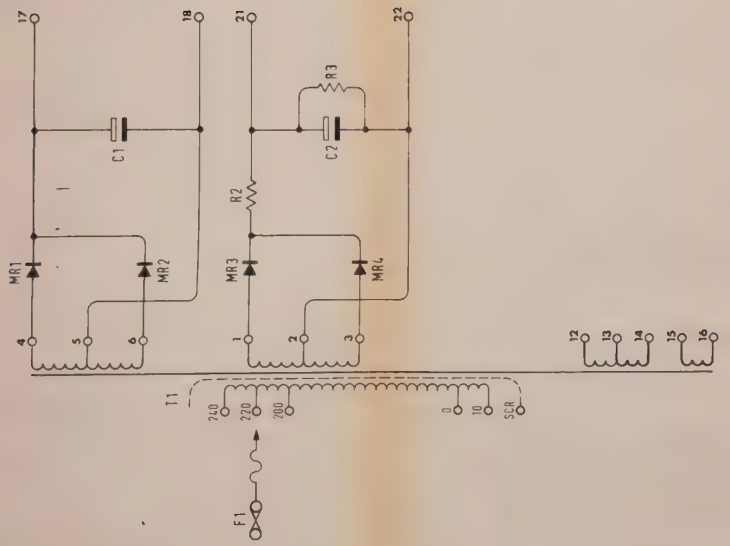
A·P·T ELECTRONIC INDUSTRIES LIMITED
BYFLEET, SURREY, ENGLAND TEL. BYFLEET 4113

TITLE	SHEET No. 1 of 1 sheets	CIRCUIT COMPONENT LIST
CIRCUIT DIAGRAM TRANSFORMER-RECTIFIER ASSY. FOR MODELS SCV32A-1, SCV32A-2, SCV33A-3 AND SCV33A-4.		CL 25571

THIRD ANGLE PROJECTION B.S.308

MODEL SCV 32A-1
MODEL SCV 32A-2
MODEL SCV 33A-3
MODEL SCV 33A-4

TRANSFORMER RECTIFIER ASSEMBLY



B25571 Issue 2

MI N° 0487	2	14/8/67
ORIGINAL ISSUE	1	18-4-67
MODIFICATION	ISSUE	DATE

MATERIAL

TOLERANCES UNLESS OTHERWISE STATED
FRACTIONAL DIMENSIONS WITHIN 1/64"
DECIMAL DIMENSIONS WITHIN

DIMENSIONS IN INCHES

SURFACE ROUGHNESS

SCALE

A·P·T ELECTRONIC INDUSTRIES LIMITED
BYFLEET, SURREY, ENGLAND TEL BYFLEET 41131

DRAWING NUMBER
B25571

CIRCUIT REF	NAME / REF No.	VALUE	TOL %	RATING
R1	RESISTOR, METAL OXIDE, APT. Pt. No. 23125-472	4.7K	5	½W
R2	" " " " " " 23125-102	1K	5	½W
R3	" " " " " " 23125-181	180	5	½W
R4	" " " " " " 23125-122	1.2K	5	½W
R5	" " " " " " 23125-222	2.2K	5	½W
R6	" " " " " " 23122-102	1K	2	½W
R7	Omitted			
R8	Omitted			
R9	RESISTOR, METAL OXIDE, APT. Pt. No. 23125-473	47K	5	½W
R10	Omitted			
R11	Omitted			
R12	RESISTOR, METAL OXIDE, APT. PT. No. 23125-472	4.7K	5	½W
R13	" " " " " " 23125-332	3.3K	5	½W
R14	" " " " " " 23125-562	5.6K	5	½W
R15	" " " " " " 23125-151	150	5	½W
R16	" , W/W, APT. TYPE SFM.	1.05K	2	¾W
R17	" , METAL OXIDE APT. Pt. No. 23125-271	270	5	½W
R18	" " " " " " 23125-222	2.2K	5	½W
R19	" " " " " " 23125-111	110	5	½W
R20	" " " " " " 23125-473	47K	5	½W
R21	" " " " " " 23125-331	330	5	½W
R22	" " " " " " 23125-560	56	5	½W
RA	" " " " " " 23125	See table	5	½W
RB	Omitted			
RC	RESISTOR, W/W, APT TYPE SFM	See table	2	¾W
RD	OMITTED	Link		
RE	RESISTOR, W/W APT. TYPE SFM	See table	2	¾W

MODIFICATION	ISSUE	DATE
ORIGINAL ISSUE	1	18/4/67

A-P-T ELECTRONIC INDUSTRIES LIMITED
BYFLEET, SURREY, ENGLAND TEL. BYFLEET 41131

TITLE: CIRCUIT DIAGRAM
CONTROL CARD TYPE A.
FOR MODEL - SCV32A-1

SHEET No. 1 of 3 sheets

CIRCUIT COMPONENT LIST CL 25570

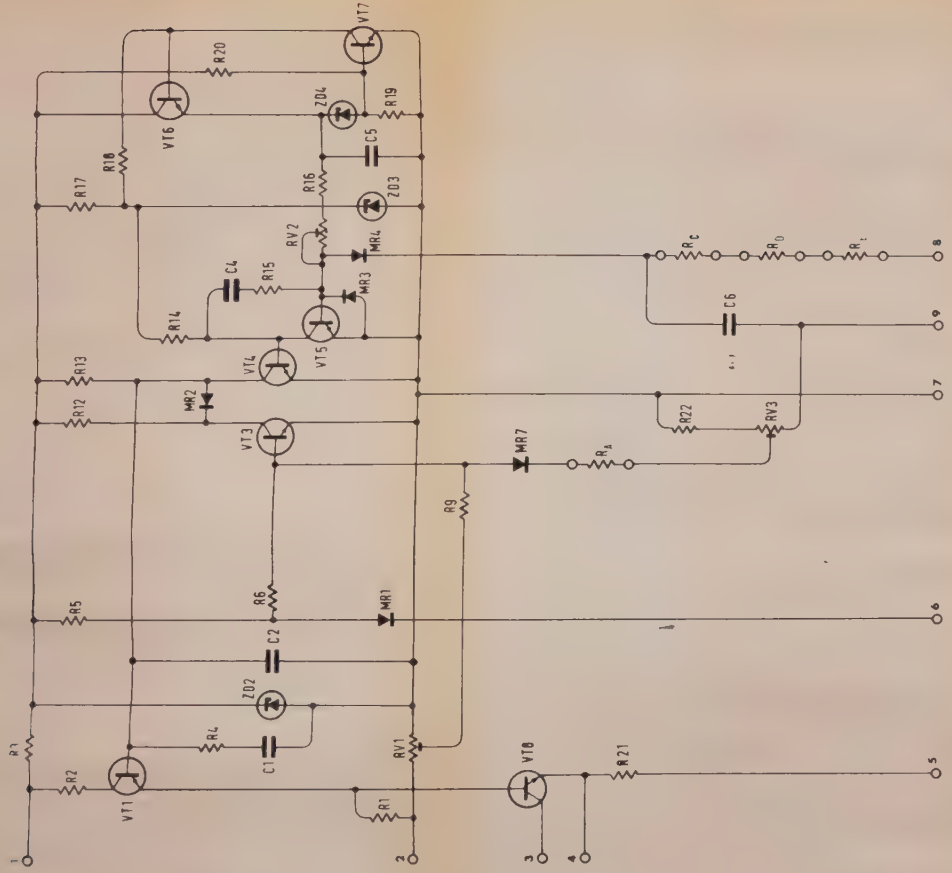
CIRCUIT REF	NAME / REF No.	VALUE	TOL %	RATING
RV1	RESISTOR, W/W PRESET APT. Pt. No. 27101-151	150	10	½W
RV2	" " " " " " 27101-151	150	10	½W
RV3	" " " " " " 27101-151	150	10	½W
C1	CAPACITOR, POLYESTER APT. Pt. No. 13111-473	0.047µF	10	160V
C2	" " " " " 13112-471	470pF	20	400V
C3	Omitted			
C4	CAPACITOR, POLYESTER APT. Pt. No. 13111-104	0.1µF	10	160V
C5	" " " " " 13111-104	0.1µF	10	160V
C6	" " " " " 13111-474	0.47µF	10	160V
VT1	TRANSISTOR, MULLARD BC107			
VT2	Omitted			
VT3	TRANSISTOR, MULLARD BC108			
VT4	" " BC108			
VT5	" " BC108			
VT6	" " BC108			
VT7	" " BC108			
VT8	" " BFY52			
MR1	DIODE, SILICON, TRANSITRON SG949A			
MR2	" " " SG949A			
MR3	" " " SG949A			
MR4	" " " SG949A			
MR5	Omitted			
MR6	Omitted			
MR7	DIODE, SILICON, TRANSITRON SG949A			

MODIFICATION	ISSUE	DATE
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TITLE	SHEET No. 2 of 3 sheets	CIRCUIT COMPONENT LIST
CIRCUIT DIAGRAM CONTROL CARD TYPE A. FOR MODEL SCV32A-1.		CL 2557Q ..

THIRD ANGLE PROJECTION B.S.308



MODEL SCV32A-1

CONTROL CARD TYPE A

B25570

ORIGINAL ISSUE	1	18-4-67
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MATERIAL

TOLERANCES UNLESS OTHERWISE STATED
FRACTIONAL DIMENSIONS WITHIN ± 1/64"
DECIMAL DIMENSIONS WITHIN ±

DIMENSIONS IN INCHES

SURFACE ROUGHNESS

SCALE

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BYFLEET, SURREY, ENGLAND TEL. BYFLEET 41131

TITLE
CIRCUIT DIAGRAM

DRAWING NUMBER
B25570

CIRCUIT REF.	NAME / REF. No.	VALUE	TOL %	RATING
R1	RESISTOR, METAL OXIDE APT. Pt. No. 23125-331	330	5	½W
R2	" , W/W BIFILAR (2OFF 0.24Ω 1.5W)	0.12	2	3W
R3	" , METAL OXIDE APT. Pt. No. 23125-100/1	10	5	½W
R4	Omitted			
R5	Omitted			
R6	RESISTOR, W/W BIFILAR (2 off 0.24Ω 1.5W)	0.12	2	3W
R7	" , METAL OXIDE APT. Pt. No. 23125-100/1	10	5	½W
VT1	TRANSISTOR, RCA 2N3055			
VT2	Omitted			
VT3	TRANSISTOR RCA 2N3055			

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MI No.3477	2	7.7.67
ORIGINAL ISSUE	1	18/4/67
MODIFICATION	ISSUE	DATE

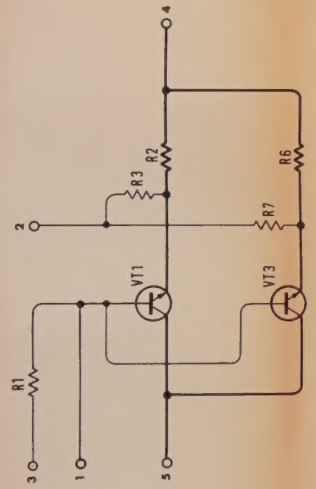
A·P·T ELECTRONIC INDUSTRIES LIMITED
BYFLEET, SURREY, ENGLAND TEL. BYFLEET 41131

TITLE	SHEET No. 1 of 1 sheets	CIRCUIT COMPONENT LIST
CIRCUIT DIAGRAM HEATSINK ASSY. FOR MODELS SCV32A-1 SCV32A-2		CL 25572

THIRD ANGLE PROJECTION B.S.308

MODEL SCV 32A-1
MODEL SCV 32A-2

HEATSINK ASSEMBLY



B25572 Issue 2

MI Nº 0487	2	14/8/67
ORIGINAL ISSUE	1	18-4-67
MODIFICATION	ISSUE	DATE

MATERIAL

FINISH

TOLERANCES UNLESS OTHERWISE STATED
FRACTIONAL DIMENSIONS WITHIN ± 1/64"
DECIMAL DIMENSIONS WITHIN ±

DIMENSIONS IN INCHES

SURFACE ROUGHNESS

SCALE

A·P·T ELECTRONIC INDUSTRIES LIMITED
BYFLEET, SURREY, ENGLAND TEL. BYFLEET 41131.

TITLE

DRAWING NUMBER

B25572



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